



# ELECTRONIC COOLING FLUID IMPROVES TEMPERATURE CONTROL ON COMMERCIAL MAINFRAME COMPUTERS

11



## Payoff

A synthetic electronic coolant, developed by the Air Force to cool electronic systems on aircraft, is helping to improve the operations and reliability of commercially produced mainframe computer systems. Because this hydrocarbon polyalphaolefin-based coolant fluid is biodegradable and less expensive than traditional electronic coolants and heat transfer fluids, it has a broad range of potential applications throughout the high tech electronics industry.

## Accomplishment

A synthetic electronic coolant fluid developed by engineers in the Materials and Manufacturing Directorate to cool advanced electronic systems on Air Force aircraft, is now being used by Honeywell and Unisys to cool their mainframe computers. This synthetic hydrocarbon polyalphaolefin (PAO)-based coolant fluid outperforms traditional fluids in closed loop systems and is biodegradable. It is currently being commercially produced and marketed by Royal Lubricants Company Incorporated of East Hanover NJ and Castrol Incorporated of Irvine CA.

## Background

As electronic components in Air Force weapon systems grow in capability and complexity, cooling the components becomes a significant safety and reliability issue. For many years, the Air Force used a silicate ester-based coolant, MIL-C-47220, to maintain safe operating temperatures for these systems. As aircraft became more sophisticated and electronics became more powerful, serious maintenance problems developed with this type of coolant on the Air Force's SR-71, F-15, B-1B and several Navy systems. On the B-1B, the traditional coolant was reacting with moisture to form a silica gel buildup. This buildup facilitated electrical arcing and also clogging the aircraft's coolant filters, resulting in pump failure and component overheating. It was further revealed that this reaction was forming alcohol that had a flash point dangerously below the operating temperature of most of the aircrafts' electronic components. Converting the B-1B fleet to PAO dramatically improved aircraft safety and reliability by eliminating these problems while reducing operating costs (PAO cost 75 percent less than silicate ester coolants). Life cycle cost-saving projections for the B-1B alone surpass a half billion dollars. For these reasons, the Air Force and Navy have switched to the improved coolant for most of their aircraft. PAO is also being used in the Air Force's LANTIRN System and the Army's Patriot Missile. Its successful transition to operational systems has led to innovative applications in the private sector. PAO's application in cooling mainframe computers with closed cooling loops has demonstrated its superiority to conventional coolants such as water glycol and fluorinated oils. In the case of water glycol, an algae problem has been eliminated. PAO is less expensive than fluorinated oils and less reactive with certain materials.